

# NASA TECH BRIEF

## Ames Research Center



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### Metered Oxygen Supply Aids Treatment of Domestic Sewage

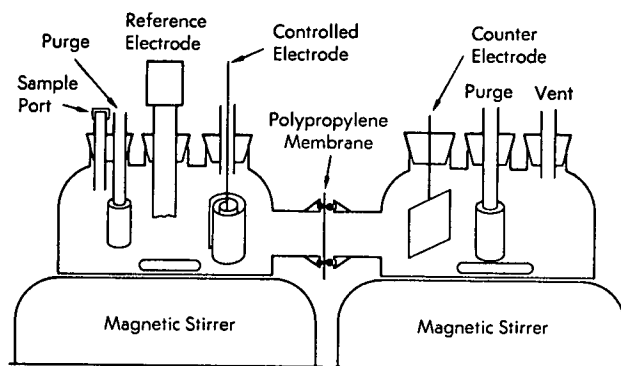
Microbiological waste-treatment processes are widely used for converting domestic wastes into substances such as carbon dioxide, nitrates, phosphates, amino acids, etc. However, disposal of sewage which is heavily loaded with solids is difficult because more oxygen is required than can be supplied by the amount that is normally present in the sewage, and ordinary waste treatment facilities seldom are designed to cope with heavily loaded sewage.

A microbiological fixed-bed process has been developed in which the supplementary oxygen required by microbial species is supplied by an electrochemical device; the rate of addition of oxygen is controlled to maintain aerobic metabolism and prevent anaerobic metabolisms which produce odorous or toxic products.

The experimental electrochemical device is shown schematically in the diagram; it consists of a hollow cell or chamber (separated into two parts by a membrane permeable to salts), two electrodes, and two elastomeric gaskets. The two electrodes can be made of platinum or other inert, conducting material and are located on opposite sides of the permeable membrane. Holes are located in the anode compartment for introduction and removal of the waste mixture, and in the cathode compartment for flow of electrolyte and removal of hydrogen.

In experiments with this model, the cell was tilted at an angle of 15° with the anode facing up. Waste mixture was allowed to drop on the anode until it was covered with a bed of microbial growth which also filled the gap between the anode and membrane so that a conductive bridge was present between the

anode and cathode electrolytes. Sewage could be dripped over the microbial bed at such a rate that dissolved oxygen in the effluent was maintained constant at selected concentrations. Under these condi-



tions, oxygen was supplied at the rate at which it was consumed; an excess was maintained to avoid anaerobic conditions in the system.

By measurement of oxygen concentration and adjustment of the rate of generation of oxygen (so that the concentration remains constant with time), sewage utilization rates may be determined, or constant concentrations of reactants or products may be maintained, depending on requirements.

The form, shape, and size of the devices may be modified. Cells may be combined in series or parallel to accommodate the requirements placed on their use.

#### Notes:

1. The following documentation may be obtained from:

(continued overleaf)

National Technical Information Service  
Springfield, Virginia 22151  
Single document price \$6.00  
(or microfiche \$0.95)

Reference:

NASA CR-73033 (N66-39889), Applications  
of Immobilized Biological Agents to Waste  
Treatment.

2. No additional documentation is available. Specific  
questions, however, may be directed to:

Technology Utilization Officer  
Ames Research Center  
Moffett Field, California 94035  
Reference: B72-10557

**Patent status:**

NASA has decided not to apply for a patent.

Source: Norman Weliky, Thomas J. Hooper, and  
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TRW, Inc. Systems Group  
under contract to  
Ames Research Center  
(ARC-10024)